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The Function of Retrieval Cues in the Release from the Pi Paradigm

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THE FUNCTION OF RETRIEVAL CUES IN THE RELEASE FROM PI PARADIGM

by

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VITA

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CONTENTS OF APPENDIX A

CHAPTER I

REVIEW OF RELATED LITERATURE

Keppel and Underwood (1962) showed that proactive inhibition (PI) is involved in short term memory tasks. The Brown-Peterson paradigm is a memory task in which a small set of verbal material is presented to be remembered (TBR) by the S. During a short retention interval, the S is required to perform a distractor task to prevent rehearsal of the verbal material. Keppel and Underwood found that recall performance decreased appreciably over the first few trials. This decrement in performance was attributed to the build-up of PI. By demonstrating that STM was affected by the number of preceding items just as LTM had been affected by the number of preceding lists, support was given to the interference theory of PI.

Wickens, Born, and Allen (1963) attempted to extend the findings on list similarity in LTM to the retention of consonant trigrams and numerical trigrams in STM. Wickens et al. (1963) found that the build-up of PI depends on the similarity of the items across trials. They found that changing the nature of the material TBR after several trials of similar material, would result in greatly improved performance. This higher level of performance, after changing category similarity, was interpreted as "release from PI."

Wickens (1970) suggested that the build-up of PI when items are similar across trials is due to intertrial interference when all

words are encoded using the same attribute. When the category is changed on the critical trial, Wickens proposed that a new, unique, retrieval cue is provided for the material on the critical trial. The provision of a new retrieval cue reduces the interference between the last items and the preceding items at the time of retrieval.

Wickens (1972) reported several studies showing that the relative amount of release from PI depends on the encoding dimensions. Switching from words to numbers on the critical trial provides approximately 95% release from PI. Other switches of a semantic nature as from masculine to feminine, or from one taxonomic class to another also provide high amounts of release from PI. On the other hand, shifts of marking-syntactic attributes provide very little release. Shifts as verb-adjective, verb-noun, tense, or singular-plural provide approximately 2% release from PI. The present experiment will attempt to make use of the fact that various dimension shifts yield different amounts of release from PI.

Gardiner, Craik, and Birtwistle (1972) examined two different types of explanations for the release from PI phenomenon. The present experiment will extend the scope of the Gardiner et al. (1972) experiment. Gardiner et al. (1972) attempted to examine the relative value of the storage explanation and the retrieval explanations of release from PI. The storage hypothesis states that release from PI occurs because the changed nature of the items on the critical trial makes those items less likely to interact with the preceding class of items. Items on the shift trial then should be less subject to

inter-trial interference (Posner, 1967). The retrieval hypothesis states that the build-up of PI demonstrates the ineffectiveness of one retrieval cue for many items. When the material is changed on the critical trial, a new, more effective retrieval cue is provided.

Gardiner et al. (1972) suggested that the retrieval explanation of the release from PI phenomenon was supported. In the Gardiner et al. experiment, TBR material was presented from two subsets of a category, for example, the subsets "wildflowers" and "garden flowers" from the category "flowers." Word trigrams from one subset were presented for several build-up trials and then a word from the complementary subset was presented on the critical shift trial.

Gardiner et al. had the control group receive no subset cue but only the general category cue "flowers" at the beginning of the memory task. It should be noted here that a departure was made from the typical control group in this case. Under the release from PI paradigm developed by Wickens et al. (1963), the control group does not get a change in the nature of the material to be encoded on the critical shift trial as the experimental group does. Gardiner et al., however, did switch the material on the critical trial to the opposite subset for the control group as well as for the experimental groups. By only using the single cue "flowers" similar encoding was facilitated for the control group. Performance for the control group continued to decline on the shift trial and no release from PI was obtained for the control group.

The Gardiner et al. experiment was designed to test the difference between the storage and retrieval hypotheses of the

release from PI phenomenon. The two experimental groups were given subset cues at either the time of presentation of the TBR material (group CP) or at the time of recall (group CR). A difference in performance was shown between the control group and group CR. At the time of storage the control group and the CR group were given the same treatment. Since a difference in performance was shown, this difference must be due to the subset cue presented at retrieval time.

Gardiner et al. suggested that the retrieval cue could function in one of two ways. The cue may increase the number of words for the S to consider as responses. Or the cue may not make more words accessible for retrieval, but the cue helps to discriminate current shift items from previous items. Although the retrieval hypothesis was supported by the Gardiner et al. experiment, the exact function of the retrieval cue could not be determined from the data.

The purpose of the present experiment is to investigate the function of the retrieval cue. This experiment will determine if cues increase accessibility to the TBR material or whether the cues help to discriminate current from previous items. The subset retrieval cues used in the Gardiner et al. experiment were simultaneously able to increase accessibility and discriminability to TBR material. Hence by using only a subset retrieval cue one is not able to differentiate between the two possible functions of the recall cue. The problem may be studied by providing either cues that increase accessibility but not discriminability of shift items or, cues that aid discriminability but not accessibility.

Although Gardiner et al. found no difference in the amount of release from PI for groups given the subset cue at presentation or at retrieval time, no information was available on the use of discriminative cues. Therefore, it was decided to use both the discriminative cue and subset cues at both presentation and retrieval time.

The present experiment will compare the performance of five groups which were given: discriminative cues at presentation, discriminative cues at retrieval time, subset cues at presentation, subset cues at retrieval time, and a control group which received no cue. The subset cue could function as either a discriminative aid or could function to make more items accessible for retrieval. The discriminative cue should not make more items accessible for retrieval. By induction, if the discriminative cue provides an equivalent amount of release from PI as the subset cue does, then the subset cue is functioning to aid discrimination.

In the present experiment the dimension of singular-plural was used as a discriminative cue. When used alone, the shift from singular to plural yields only about 2% release from PI (Wickens, 1972). In the present experiment, the discriminative cue of "singular words" or "plural words" was used for two groups, one group receiving the cue at presentation and the other at retrieval time. The subset cue of "wild animals" or "domestic animals" was given at presentation for one group and at retrieval time for another group. Subsets were shifted for all groups on the final recall trial. If the subset cue is functioning to aid discrimination,

the explicit provision of the discriminative cue should give as much release from PI as the subset cue.

CHAPTER II

METHOD

Subjects

The Ss were 160 introductory psychology students from the University of Illinois at Chicago Circle who were fulfilling a service requirement. Ss were assigned randomly and equally to 5 groups of 32 Ss each. Ss were tested individually and Ss who did not perform properly on the distractor task were replaced.

Materials

A pool of 24 TBR words was selected in the same manner as for the Gardiner et al. experiment. Fifteen Ss who were not subsequently tested, completed a familiarity rating of 80 names of animals on a three-point scale. The Ss then categorized each word as belonging to one of two subsets (wild or domestic animals). (The instructions read to the raters may be found in Appendix A.) If a word did not appear to belong to either category primarily, or if it appeared to belong to both categories, the Ss were instructed to place that word in a "reject" pile. Words chosen met the following criteria: (1) the words had a mean familiarity rating of 2.5 (out of 3) or more; and (2) that at least 12 out of 15 Ss had assigned the word to the same subset. Twelve words were selected for each subset. The category subset names "wild animals" and "domestic animals" were used as the subset cues. "Singular words" or "plural words" were used as the

discriminative cues.

Thirty-two unique lists were made up of a random draw of 9 TBR words and 3 words from the complementary subset. This insured that each S within groups received a unique set of TBR material. Half the Ss received a shift from the subset "wild animals" to "domestic animals" and the other half received the shift in the opposite direction. Half the Ss received a shift from "singular words" to "plural words" and the other half received a shift in the opposite direction. Because of the nature of the design, there was always a double shift occurring. That is, the shifts were: wild-singular to domestic-plural, and wild-plural to domestic-singular; and, likewise, domestic-singular to wild-plural and domestic-plural to wild-singular. Each group of Ss was cued for only one of the dimension shifts.

Procedure

All Ss were given identical instructions and treated identically until the shift trial. (The instructions may be found in Appendix A.) They were told that the experiment was a memory task and were given a demonstration trial during the course of instruction. During the demonstration the Ss were given practice on the distractor task. The distractor task was an arithmetic task in which pairs of numbers are shown on a slide. The S was instructed to read the numbers aloud for each pair, to add the two numbers of the pair mentally and say the sum aloud, and finally to say whether the sum is odd or even. The S was also instructed to go on to the next pair of numbers as soon as each pair was completed.

Ss were told that they might be given cues at the time of presentation or time of recall for the words TBR. The Ss were not warned in advance that a subset change might occur or that the material might be switched from the singular to the plural form. After the demonstration trial and the instructions were completed, each S was given four practice trials with the four possible types of cues. The material used on the practice trials was identical for all Ss and consisted of material not used in the experimental trials.

All the TBR material and the category cues were presented by a Kodak carousel projector equipped with a timing device and projected onto a small screen. The S was seated in a room adjacent to the E and he could communicate through an intercom system. Each trial began with presentation of a slide containing three asterisks as a ready signal. This slide was presented for 1.5 sec. The next slide was presented for 2 sec. This second slide was usually blank except when a cue was given at presentation time. The third slide always contained the TBR triad which was shown for 2 sec. The fourth slide contained the 18 number pairs which were the distractor task. The distractor task was presented for 15 sec. The fifth and final slide in each trial was projected for 9.5 sec. and indicated that the S should try to remember the TBR triad just learned. That the S should know that this was the recall time was indicated by presenting a "?" before the cue. For example, "?WORDS" was used to indicate recall time for most trials. On trials where a cue was given at retrieval time, the slide contained a question mark and the

appropriate cue as "Wild Animals." The total length of each trial was 30 sec. As soon as one trial was completed, the series was immediately repeated.

All groups received "ANIMALS" as a cue on Trial 1 and then no cues on Trials 2 and 3. On Trial 4 group SP received a subset cue at presentation time for the test shift trial. On Trial 4 group SR received a subset cue at retrieval time. Group DP received a discriminative cue at presentation and group DR received a discriminative cue at retrieval time. The control group received no cue on Trial 4.

CHAPTER III

RESULTS

The percent of words correctly recalled for each group on the four experimental trials is shown in Figure 1. The order of the words as they were recalled by the S was not taken into account here, but only whether or not the word was recalled on the appropriate trial.

In all but the SR group, recall declined over the first three trials and for that group recall dropped 18% from Trial 1 to Trial 2, but increased 1% on Trial 3.

An analysis of variance over the first three trials showed that the main effect due to trials was highly significant F (2,280) = 28.94, $p < .001$ (see Table 1). The F ratios for the main effect due to groups (types of cues) and for the main effect due to the various category subset and singular-plural switches were not significant. Neither were the interactions of these variables with each other or with the trials significant. These results indicate that there was a build-up of PI over the first three trials and that the build-up was similar for all five groups.

The control group's recall did not continue to decline on Trial 4. Group SP showed a 73% release from PI on Trial 4. It was not possible to compute the percentage of release from PI for the other three experimental groups since the control group, group C,

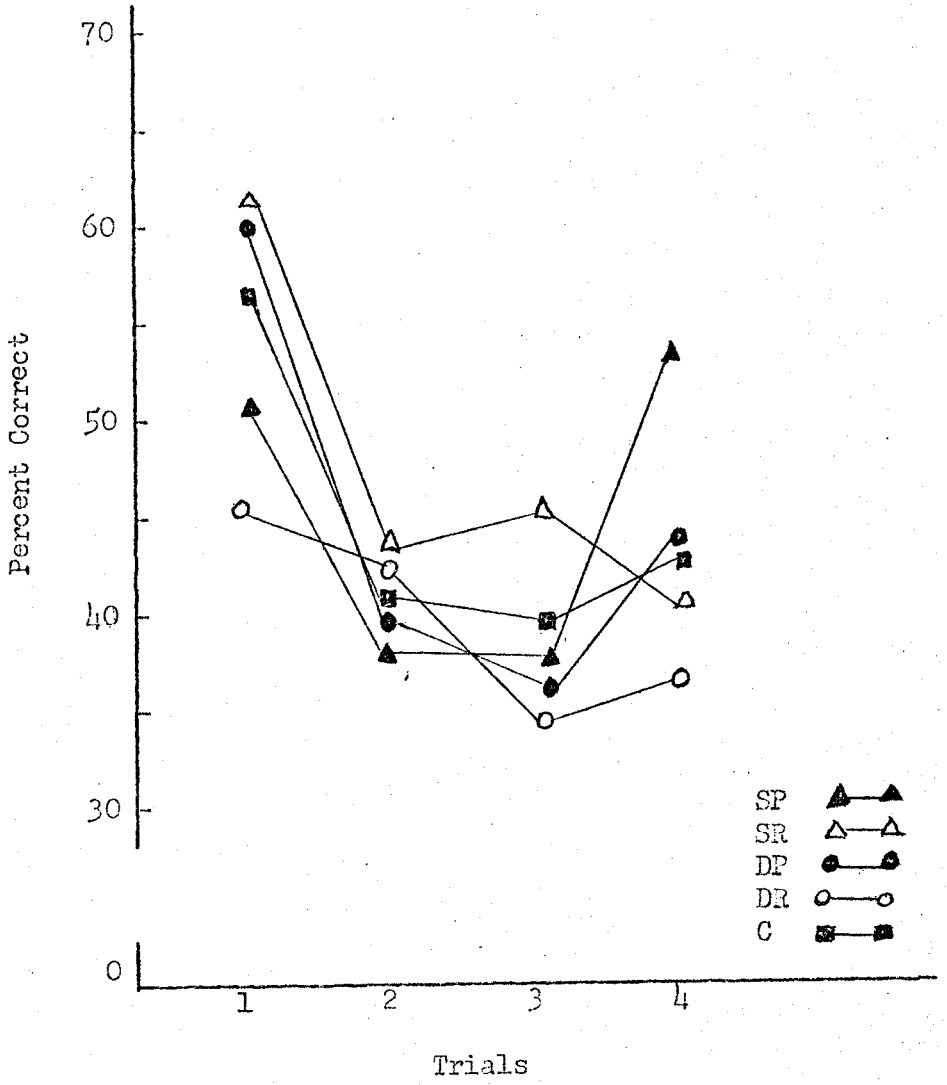

Figure 1. Percent of words recalled as a function of type and position of cue.

Group SP--Subset cue at presentation
Group SR--Subset cue at retrieval
Group DP--Discriminative cue at presentation
Group DR--Discriminative cue at retrieval
Group C--Control group--No cue

TABLE 1

Summary of Analysis of Variance On Data From The First Three Trials

Source	SS	df	MS	F
Between Subjects	152.565	159		
A (type of cue)	7.200	4	1.800	1.95
B (subset switch or singular-plural)	5.356	3	1.785	1.93
AB	10.467	12	.872	.94
Subjects within groups (error (between))	129.542	140	.925	
Within Subjects	255.333	320		
C (trials)	40.454	2	20.227	28.94*
AC	5.588	8	.699	1.00
BC	1.313	6	.219	.31
ABC	12.145	24	.506	.72
C x Subjects within groups (error (within))	195.833	280	.699	

*$p < .001$

also showed higher recall on Trial 4 than on Trial 3. The performance of the group DP was equal to group C on the fourth trial and the performance of groups SR and DR was actually lower than group C on Trial 4. Group DP and DR did exhibit the pattern of release from PI even though the amount was too small to enable a comparison to the control group to be computed. Group DP showed a 9% increase on Trial 4 over Trial 3, and group DR showed a smaller 2% gain on Trial 4 over Trial 3. However, since the control group C showed a 5% gain, the percentage of release from PI could not be computed.

Although group SR did show atypical performance on the recall Trials 3 and 4, the deviance was actually very small. For Trial 3 recall was 1% higher than on Trial 2; recall declined 3% from Trial 3 to Trial 4.

A second analysis of variance performed on data from Trial 4 for all five groups showed that the main effect due to groups was not significant, F (4,140) = 1.94, $.25 > p > .10$ (see Table 2). The main effect due to category subset switches and singular-plural switches yielded an F ratio less than 1 and not significant. The interaction of the groups and the subset and singular-plural switches was not significant, F (12,140) = 1.37, $.25 > p > .10$. These results indicate that the various cue conditions were not effective in systematically helping recall performance on Trial 4. The various category subset and singular-plural switches produced no systematic differences.

Table 3 and Table 4 provide a more detailed presentation of the experimental data. Table 4 gives a breakdown of the proportion of correct responses by trials for each group. Inspection of this data

TABLE 2

Summary of Analysis of Variance

On Data From Trial Four

Source	SS	df	MS	F
A (type of cue)	7.963	4	1.991	1.94
B (switch of subset or singular-plural)	.169	3	.056	
AB	16.487	12	1.374	1.34
Within cell	138.125	140	.987	
Total	162.744	159	1.024	

TABLE 3

Means of Cue Conditions by Trial

	Trial 1	Trial 2	Trial 3	Trial 4
Group SP	2.09	1.66	1.50	2.19
Group DP	2.47	1.69	1.47	1.84
Group SR	2.50	1.78	1.84	1.72
Group DR	1.88	1.75	1.44	1.50
Group C	2.31	1.72	1.63	1.84

TABLE 4

Percent Correct by Groups by Trial

	Trial 1	Trial 2	Trial 3	Trial 4
Group SP	52	41	38	55
Group DP	62	42	37	46
Group SR	63	45	46	43
Group DR	47	44	36	38
Group C	58	43	41	46

may indicate certain trends. In general, the groups decrease over the first three trials and increase on the fourth trial. Group SP deviates from this pattern, as was noted above, although the deviations are of a very small magnitude. The most startling finding is that of the control group obtaining a small amount of release from PI, as can be noted by inspecting Table 3 and Table 4.

Table 5 presents the source of intra-experimental intrusions. Seventy-six percent of the intra-experimental intrusions were from the immediately preceding trial, while 22% are intrusions from two trials back. Only 2% occur as intrusions from three trials back. Of course there is more opportunity for intrusions to occur from the immediately preceding trial. For each S, the ratios would be: three to two to one. That is, there are three times as many opportunities for words to come from the preceding trial as from three trials. There are twice as many chances for a word to come from two trials back as from three trials back because each S only receives a series of four trials. By chance, we would expect that 50% or 68 of the intrusions would have come from the immediately preceding trial. However, Table 5 shows that the actual number was 103. Likewise, by chance, we would expect 33.3% or 45 intrusions to originate from two trials back. The actual number of intrusions originating from two trials back was only 30. One would expect that 16.6% or 23 intrusions might come from three trials back by chance. The actual number was 3. Intra-experimental intrusions are much more likely to occur in the immediately succeeding trial after the intrusion was first presented. If a word was recalled correctly on the appropriate trial, it was more

TABLE 5

Source of Intra-Experimental Intrusions by Number of Preceding Trials and Serial Position of Intruding Word As It Was Presented For Learning

Intruding word was presented	Word was presented in first position	Word was presented in second position	Word was presented in third position	Total
In the preceding trial	41	37	25	103
Two trials back	4	16	10	30
Three trials back	0	0	3	3
Total	45	53	38	136

likely to appear as an intrusion on later trials. Of 136 intrusions, 101 words had been recalled correctly on prior trials compared to 35 words that were not recalled on the appropriate trial but surfaced as intrusions later on. Intrusions were more likely to occur when the word had been presented for recall in the second serial position than if it was presented in the first or second position. Table 6 shows the percent of intra-experimental intrusions when corrected for the number of intrusions that are possible for each occurrence.

Omissions of TBR words are summarized in Table 7. In general, across trials the number of errors increased for the first three trials as PI was building up and then declined in Trial 4 when release from PI occurred. It appears that the first word in an item TBR is slightly easier to retain and recall as more omissions occurred in the second and third words of each item. The number of omissions has an indirect effect on the number of intrusions. If more words are omitted on a single trial, then there is more opportunity for intrusions to occur. Since the S almost invariably outputs three words for each item, as more words are correctly recalled for each trial, there is less chance for intrusions to occur.

The number of extra-experimental intrusions are categorized by trial and position of the TBR word in the item in Table 8. All extra-experimental intrusions in this study were from the main category "animals." Sixty percent of the intrusions in Trial 1 and 22% of those on Trial 2 were anticipatpry intrusions, that is, stimuli presented TBR on later trials. On the later trials, if these same words were intrusions, they would then be classified as intra-

TABLE 6

Percent of Intra-Experimental Intrusions by Source

Corrected For Number of Possible Intrusions

Intruding word was presented	Word was presented in first position	Word was presented in second position	Word was presented in third position
In the preceding trial	9	8	5
Two trials back	1	5	3
Three trials back	0	0	2

TABLE 7

Omissions in Recall by Trial and Position of Omitted Word in Item

	Trial 1	Trial 2	Trial 3	Trial 4	Total
First word in item	33	60	70	59	222
Second word in item	37	78	76	58	249
Third word in item	48	65	77	69	259
Total	118	203	223	186	730

TABLE 8

Extra-Experimental Intrusions by Trial and Position of Word in Item

	Trial 1	Trial 2	Trial 3	Trial 4	Total
First word in item	6	1	0	8	15
Second word in item	11	6	6	6	29
Third word in item	18	3	1	10	32
Total	35	10	7	24	76

Note: All intrusions were from the main category "animals." Sixty percent of the intrusions in Trial 1 and 22% of intrusions on Trial 2 were actually stimuli presented to be remembered on later trials or anticipatory intrusions. However, since the S reported these words before they were actually presented for study, they are classified as extra-experimental intrusions.

experimental intrusions. However, since the S reported these words before they were actually presented for study, they are classified as extra-experimental intrusions here.

CHAPTER IV

DISCUSSION

The experiment demonstrated a reliable build-up of PI when all words are drawn from either the subset "wild animals" or "domestic animals." Evidence of release from PI was obtained in all but one group, group SR. It would seem that the actual subset switch was more effective in producing release from PI than the cuing conditions, since the control group C which received no cues also received release from PI. This study used a control group which differed from the typical Wickens' control group. In Wickens' (1970, 1972) studies the control group does not receive a subset switch in the material but continues to receive items from the original category on the final trial. Gardiner et al. also used a control group which received a subset shift in TBR material on the final trial as the present study did. However, Gardiner et al. found release from PI only when the S was given the appropriate subset cue at either presentation or retrieval time. Gardiner et al. found no release from PI in the control group even though the subset of the TBR material was changed.

The recall of a control group which received no subset shift on the final trial would have been more likely to continue to decline on that fourth trial. A control group such as used by Wickens (1970) would increase the probability of obtaining a greater amount of

release from PI in the experimental groups. Because the present experiment and the Gardiner et al. experiment obtained different results, future studies of this type should also include a Wickens-type control group.

Although the present study was very similar to the Gardiner et al. study, the two studies differ in that Gardiner et al. did not obtain release from PI in the control group and the present study did. In both experiments, the control did receive a shift from one subset to another and no cue was given to the S. Part of the discrepancy in results may be simply due to the fact that more Ss in the present experiment noticed that the TBR material had changed. Gardiner et al. report that in the control group and the group who received a subset cue at retrieval time, only two out of sixty-four Ss reported noticing a change in the material on the shift trial when they were questioned by the E. In the present experiment nearly a third of those Ss questioned replied that they noticed a change in the material although many were unable to pinpoint exactly what kind of change had occurred. One may be tempted to conclude that the distinction between garden flowers and wild flowers is more subtle or less noticeable than the distinction between domestic animals and wild animals. However, there are other possible explanations.

The actual list of "wild animals" and "domestic animals" used in the present experiment may be found in Appendix A. Although attempts to equate the familiarity of both subsets was made by using the rating procedure outlined in the Method section, the "domestic" and "wild" animals were not equally familiar. Very few of the wild

animals were as familiar as most of the domestic animals. For example, three of the domestic animals received the highest familiarity rating of "Three," although none of the wild animals did. Out of 80 animals that were rated, 17 were classified as domestic and the rest as wild. The domestic animals had a mean familiarity rating of 2.78 compared to the mean of 2.47 for the wild animals. This was discussed before the experiment was done but was felt to be an unavoidable problem. Another related problem is that the words which are classified as "wild" are on the average longer than the "domestic" words. It was expected that the familiarity rating would help to neutralize the effect of word length as a main factor in obtaining release from PI. The fact that one subset was more familiar than the other and the fact that the words of one subset were longer, were probably contributing factors in the control group obtaining release from PI.

Since all extra-experimental intrusions were from the category "animals" it appears that all the Ss were aware of this at all times and perhaps they selected or edited their responses to remain within the correct category. Several Ss were questioned after the experiment to see if they had been aware of the change from the subset "wild animals" to "domestic animals" or vice versa. More Ss indicated they noticed a change than did not. Some Ss reported being vaguely aware of a change; but, said that they were not aware of the specific nature of the subset change. Two Ss spontaneously observed that they noticed a change in the nature of the animals, both of these Ss were from the control group C. One S volunteered the information that the last set of animals "was easier to remember because they were

all furry and mean." The Ss were not systematically questioned on the matter of noticing the subset switch, so results will not be presented here. In a future experiment, questioning the S after the shift trial would seem advisable.

Since some of the experimental groups which received cues did not do as well on the final recall trial as the control group which received no cue did, one is led to conclude that perhaps the cues were not helpful in all cases. In fact, it appears that the cues may have been confusing to some of the Ss. Gardiner et al. gave the Ss in their experiment seven practice trials immediately before the experimental trials. The purpose of the practice trials was to give the S experience with all the possible cuing conditions. However, the practice trials were composed of some of the same material as the experimental trials. This procedure would tend to inflate the amount of build-up of PI and would also affect the amount of release from PI. Bennett and Bennett (in press) have demonstrated that the amount of release from PI is a function of the number of pre-release trials. The present experiment gave the Ss a limited number of practice trials, four in all, to eliminate this problem. Also, all the practice trials for the present experiment were comprised of material different from the experimental material.

The present experiment may have been a more difficult task for the S than the Gardiner et al. task, because practice was given for four different possible cuing conditions instead of the two different cuing conditions used by Gardiner et al. With the fact that less practice was allowed, and more was demanded from the S, it is not

surprising that the cues may have been confusing to the S in the short time permitted, even though the S understood the procedure. In future experiments of this type, it should be recommended that more practice be given with the various cuing conditions, but that the practice be temporally separated from the actual experiment and be on different material than the experiment itself.

Simple inspection of the results in Figure 1, seem to indicate that the presentation cue was more helpful, or at least less confusing, than the cue at retrieval time. No inferences can be made as to the relative value of the subset or discriminative cue, although the subset cue does seem to aid recall more than the discriminative cue. It seems that the subset change which was present in all groups was so salient that it masked any value the discriminative cue may have had.

REFERENCES

Bennett, B. W., & Bennett, I. F. PI release as a function of the number of pre-release trials. Journal of Verbal Learning and Verbal Behavior, in press.

Gardiner, J. M., Craik, F. I. M., & Birtwistle, J. Retrieval cues and release from proactive inhibition. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 778-783.

Keppel, G., & Underwood, B. J. Proactive inhibition in short-term retention of single items. Journal of Verbal Learning and Verbal Behavior, 1962, 1, 153-161.

Posner, M. I. Short term memory systems in human information processing. In A. F. Sanders (Ed.), Attention and Performance. Amsterdam: North-Holland Publishing Company, 1967, Pp. 267-284.

Wickens, D. D. Encoding categories of words: An empirical approach to meaning. Psychological Review, 1970, 77, 1-15.

Wickens, D. D. Characteristics of word encoding. In A. W. Melton & E. Martin (Eds.), Coding Processes in Human Memory. Washington: V. H. Winston & Sons, 1972, Pp. 191-215.

Wickens, D. D., Born, D. G., & Allen, C. K. Proactive inhibition and item similarity in short-term memory. Journal of Verbal Learning and Verbal Behavior, 1963, 2, 440-445.

APPENDIX A

INSTRUCTIONS TO SUBJECTS FOR STIMULI RATING

For this session you will be rating words that will later be used as the stimuli in a memory experiment. The words to be rated are all four-footed animals. First, you are to rate these animals on the basis of their familiarity to you, on a three-point scale. For example, a very common animal that is very familiar is a dog which would be assigned a rating of "3." An unfamiliar animal would be assigned a rating of "1." A rating of "2" means moderately familiar.

In the second part of this experiment, you will be assigning the animal words to one of two categories, wild or domestic animals, by putting a "w" or a "d" next to the word. It is important that you categorize these animals in a subjective sense, that is, if the animal appears to be wild to you, you should assign it a "w" even though in an absolute sense it may be a domestic animal. If you are unable to assign a word to one category or another, write "reject" next to the word to place it in neither category.

It is important to work as carefully as possible because the success of the experiment will depend on the proper rating and categorizing of the words.

INSTRUCTIONS TO SUBJECTS

This is an experiment on memory. We are primarily interested in the way people go about remembering small amounts of information for short periods of time. In this experiment you are going to be asked to remember items consisting of three words shown for a few seconds. You will have several trials and each trial will follow the same procedure.

Each trial will begin with the presentation of this slide with three asterisks on the screen in front of you. These asterisks are always a signal that a new trial is going to begin. (PROJECT SLIDE). This slide will be on for about 2 seconds. You should be careful to be looking at the screen while this slide is on so that you won't miss the next slide which contains the three words you are to remember. (PROJECT SLIDE showing "WORD WORD WORD."). This slide will be on for about 2 seconds also. While it is on you should read aloud all three of the words, so you would say--(S says "WORD WORD WORD."). After you have read them once, you may repeat them to yourself or do whatever it is that you find helpful for remembering them. The next slide (PROJECT) will contain some numbers arranged in pairs. You are not to remember these numbers; you will only work with them. You should start at the upper left hand corner and read both digits in the pair aloud, (EXPERIMENTER SAYS: 3,5), then say the sum (___), and then say whether the sum is odd or even. (E says "in this case it's ___") As soon as you finish with one pair of numbers go on to next. (E does the first line of the matrix as an example.) You try it. When you are working with these numbers you may be tempted to go slowly so that you

practice the words you are supposed to remember in your mind. It is hard to do, but please try to devote all of your attention to reading the numbers and not to rehearsing the words; but that is what we are interested in, because we want to know how people remember things when they can not practice or rehearse them. So for the remainder of the time these numbers are on the screen, please work with them as fast and accurately as you can. After 15 seconds, the slide with the numbers will be replaced with one that says "? WORDS." (PROJECT). This slide with the question mark is asking you to remember those words you have just learned and to say the answer out loud.

Sometimes you will be given a cue to help you remember the words. Sometimes you will be given the cue before the words are presented and sometimes you will be given the cue at the time of recall. For example, if I wanted you to remember the words "green, yellow, orange," then "colors" might be given as a cue. Or if I wanted you to remember the words: "cars, desks, daisies" I might give you "plural words" as a cue. You will have about 10 seconds to say your answer out loud. Then you will see the next slide again, (PROJECT), which shows the three asterisks signalling the beginning of the next trial.

All right, now, we will have a few practice trials so that you can work on dealing with the numbers as fast and accurately as possible. Do everything just the way you did it on the demonstration trial. Do you have any questions? (PROJECT DEMONSTRATION TRIALS).

All right, that is the end of the practice trials. Do you have any questions? O.K. We'll be ready to begin the experiment in just a minute. Are you ready?

Domestic Animals

Animals	Mean Familiarity Rating (out of 3)	Agreement on subset assignment (out of 15 raters) to wild or domestic animals
calf	2.80	15
cat	3.00	15
cow	2.93	15
dog	3.00	15
donkey	2.73	15
hog	2.80	14
horse	3.00	15
lamb	2.67	15
mule	2.60	13
ox	2.07	12
pig	2.93	15
pony	2.87	15

Mean familiarity rating = 2.78

Note: The word "sheep" had a familiarity rating of 2.67 but was not used because the singular and plural forms of the word are identical.

Wild Animals

Animals	Mean Familiarity Rating (out of 3)	Agreement on subset assignment (out of 15 raters) to wild or domestic animals
alligator	2.27	14
ape	2.47	14
bear	2.73	15
elephant	2.60	14
fox	2.33	13
giraffe	2.47	13
gorilla	2.47	15
lion	2.60	15
lizard	2.33	12
skunk	2.53	14
tiger	2.53	15
wolf	2.27	14

Mean familiarity rating = 2.47

Note: The words "kangaroo" and "buffalo" had a mean familiarity rating of 2.33 and the word "hippopotamus" had a rating of 2.27 as did "moose." These words were not used because the plural forms were thought to be awkward or too long. For the word "moose" the plural and singular forms are identical.

APPROVAL SHEET

The thesis submitted by Donna Goetz has been read and approved by the following Committee:

Dr. Robert L. Solso, Chairman
Professor, Psychology, Loyola

Dr. Paul Von Ebers
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The final copies have been examined by the director of the thesis and the signatures which appear below verify the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts.

12/30/74
Date

Robert L. Solso
Director's Signature

1/9/75
Date

Paul J. Von Ebers.